Bag In Box (BIB)

This invention relates to packaging and is particularly, but not exclusively, concerned with packaging liquids - or other flowable materials, such as powders or granules - in so called bag-in-box (BIB) containers.

In the BIB approach, a flexible-walled bag is used as an (internal) liner - and housed within a protective outer box carton, typically of semi-rigid cardboard.

The term 'carton' is used herein for convenience to embrace, not merely traditional cardboard - but, as regards the scope of the present invention, other materials, such as corrugated, solid or laminated plastics or composites.

For esoteric applications, stranded or fibre-reinforcement could also be contemplated.

BIB Alternatives - Jerrycans

A prime BIB target for substitution is a so-called jerrycan (or jerrican), being a (blow) moulded semi-rigid walled container, with an integrated neck spout (typically threaded) and complementary closure cap.

Mould tool set up costs are prohibitive for implementing low volume changes - precluding bespoke customer configurations or formats.

Some aspects of the present invention seek to contrive a direct competitive substitute for jerrycans, with further advantages.

BIB - Box Carton

A box carton is fabricated - typically die cut - from a flat carton blank sheet {- and is collapse foldable}.

Carton erection from a flat sheet 2-D form to an erect 3-D form creates a hollow shell for bag liner housing.

Generally, the shell housing completely envelopes shrouds or wraps the vulnerable bag liner and its flowable contents - so protecting it from casual impact, puncture and contents spillage.

Thus a bag liner is commonly wrapped up and sealed in a box carton.

However, issues of access to the bag and contents arise post box carton enclosure.

BIB - Bag

A bag liner is typically of plastics thin film - extruded as tubing, collapsed into a flat web.

This web can be rolled up, as a continuous length - or segmented into individual flat bags, which can be stacked.

Film thickness and material reflects a balance between robustness and cost.

Single or multiple layer or ply bag constructions may be employed.

Localised (corner edge) seam welds can help brace or define a (regular) erect form.

Having the bag fill to a predetermined (outer) contour or form, consistent with that of the intended outer carton shroud, makes for easier installation of the bag within the carton - such as by insertion from one end of a partially erected carton configuration.

Alternatively, a generic (free-form) so-called 'pillow bag' may be used to minimise overall manufacturing costs.

Bag Port

Basic bag liners commonly feature a reinforced fill and discharge port, forming or configured for location of, a contents access neck or spout.

Such bag liners may be sealed upon fill - and so require seal puncture, by say local discharge spout penetration, to allow controlled contents discharge.

Some bag variants integrate the bag wall with a semi-rigid neck upstand - for removable closure fitment.

This allows a pre-formed neck thread, with a complementary threaded screw closure cap.

Bag Format

Filled bag profiles may leave wasteful voids between (curvilinear)bag and (rectilinear)container.

Certain bag constructions have been contrived to adopt a more rectangular filled form, complementary to that of the carton outer, through judicious disposition of joining, stiffening or profiling seams.

An example is the proprietary CPAC QUAD™ bag of single skin, with four upright side corner edges and an 'H' pattern base weld to achieve a cuboid form upon contents fill.

A particular QUAD CLASSIC™ bag variant adopts a double-walled construction, in which a cylindrical inner bag is secured locally to an outer bag intermediate its corners.

The outer bag is a 'standard' balloon or pillow bag made from a single sheet - folded and edge seam welded to form a 'cuboid' bag form upon contents fill.

Internally, a cylinder of sheet material is attached in 'upright' strips along inner side walls of the outer bag.

As the internal cylinder is not secured at the corners of the external bag - upon fill, (liquid) contents flows into voids between internal and external walls.

These in turn form corner 'posts' or pillars - bringing the overall bag into a more defined 'cube' form, and contributing structural strength, stiffness and rigidity.

Bag Access

With a basic BIB format, bag fill is generally undertaken on dedicated fill line - remotely of, or at least as a discrete step from, cartoning.

Bags can be grasped at a fill neck or collar upstand, by a location flange or rim - and supported, or rather suspended therefrom, for contents fill.

Bag construction can be stressed to allow this - a factor used to advantage in the present invention for bag support within a box carton.

A closure / seal is fitted upon fill - and the filled bag dropped, as a free-form bulging sack, upon a feed conveyor - and thence to a cartoning station.

Filled bags are introduced into a part pre-assembled carton (in tubular form) - typically through open flaps at one (upper) end.

Once a bag is inserted into an outer box carton - the carton (opposite end flaps) is closed around.

Thus bag (port) contents access requires opening (one end of) the carton.

In a BIB refinement, a bag neck stem is fed through - and so located by - a complementary aperture cut-out in one end flap.

This preserves exposure of a protruding neck upstand and attendant closure beyond the box carton, for ease of contents access.

However, this arrangement is unsuitable for post-assembly fill, as with, say, a jerrycan - in what is commonly an environment wet with contents spillage.

Thus a box carton is not usually moisture-proof, but can absorb and be degraded by wetting.

Nor is a coupled bag sufficiently braced to take engagement and trigger loads from a

downward fill dispenser head.

A protruding bag neck is vulnerable in handling and dropping.

The neck also interrupts the otherwise rectangular box carton outer form, so impeding compact packing and stacking.

Bag Contents Fill

Bag contents fill is a prime consideration for a contents manufacturer.

Generally, dedicated automated filling lines are employed for a bespoke BIB configuration.

Traditional bag fill typically prefaces insertion of a filled bag into a pre-formed carton assembly.

Insertion and cartoning themselves can be a mix of manual and mechanised steps.

Fill Machinery

Resources commitment inhibits a packaging change, if incompatible with established filling machinery.

Hitherto, fill machinery for moulded jerrycans has often been incompatible with that for BIB containers.

Again, a wet fill environment is a factor.

Thus substitution of BIB alternatives to jerrycans has been impeded, not only by the need to replicate jerrycan features (discussed later), but by the need for new fill machinery - a prohibitive investment.

Collapse Fold

A collapse-folded, pre-filled condition is advantageous for compact storage and transport.

In particular, voids between containers are minimised, if not eliminated, as compared with, say, semi-rigid hollow containers (jerrycans).

On the other hand, bag filling, carton erection and bag-into-carton insertion machinery is required.

Post Fill - Collapse Upon Empty Mode

For certain applications, a facility to collapse-fold, say into a compact flat-pack, after use - that is fill and contents discharge - would be advantageous.

Thus, say, a collapsible, re-fillable water carrier - which would flat collapse fold for transport and storage between contents fill would be very convenient.

Such a collapsible carrier would find a use in camping, military and charitable aid contexts.

Moreover, collapse for waste disposal or recycling and bag from carton separation, would be useful - not least to meet legislative requirements.

This is a facility which largely escapes jerrycans - albeit certain (wall) materials allow (empty mode) resilient can deformation and even crushing.

Rather, in large-scale industrial applications, jerrycans are commonly shipped back empty after use to a supplier or waste disposal station.

Statement(s) of Invention

According to one aspect of the invention,
a Bag In Box (BIB) container [package] (10)
- for flowable materials,
including liquid, solid powders or particles -
with an inner (contents) bag liner (12)
locatable within an outer box carton (11),
has a neck piece (14),
between a bag neck (13) and carton aperture (24).

According to another aspect of the invention,
a BIB container package,
- for liquid or flowable material -
comprises a bag inner liner
and a box carton outer (shell);
with a bag (neck) location and support element,
(such as a neck piece),
configured as any one, or a combination of:

- discrete insert,
- element integral (or connected) with the bag, or some part of the bag, such as the bag neck or neck rim,
- element integral (or connected) with the carton, or some part of the carton, such as an end flap;

to create a (shallow) recess for a protruding bag neck.

This element partially enshrouds and protects the bag neck and an attendant closure

(cap).

Free access to the neck and its removable closure is preserved, for contents fill and discharge.

Box structural performance (stiffness and rigidity) is unimpeded - and can even be enhanced by judicious top ledge and neck piece configuration.

The recess preserves a 'uniform' - say rectangular - box carton outer form or profile, in turn allowing compact packing and stacking.

The recess is conveniently at an upper side edge of the carton, to facilitate contents access - in particular contents discharge, by pouring from a tilted or upturned container.

An optional supporting spill ledge or splash back guard can be integrated with the neck piece to protect the box carton locally.

Handles, such as handle cut-outs or apertures, say with pre-formed handle inserts, can be incorporated in the box carton panels, to facilitate container lift and handling - such as to preserve control when pouring.

Push in handle flaps or tabs are desirably profiled or omitted altogether to avoid abrasion interference with bag liners upon relative movement in transit.

In some constructions, a discrete insert, such as a vacuum form, thin plastics sheet, shelf, ledge or tray, is fitted between a carton top (lid closure) flap and a bag neck location or retention rim.

In other variants, a stiffener, reinforcement or bracing plate - which can also serve as a spillage or splash guard - is integrated with a carton panel, such as a folding top or lid flap.

In yet other variants, a stiffener profile is mounted upon, or integrated with, a bag neck rim, or an existing location flange for a fill station support.

Hexagonal flanges or flanges with opposed flats are known for this purpose.

A judicious combination of such variants may also be adopted - where stiffening and location is shared between a supplementary insert, bag and carton.

These features allow use of a BIB configuration upon a jerrycan fill line - with minimal or no adaptation.

This makes it easier for an existing jerrycan user to switch to a BIB container package according to the invention - for the various packaging and disposal advantages outlined herein.

According to another aspect of the invention
a container comprises
an outer (box) carton
with a recessed edge panel
and an internal bag liner
located and retained within the carton
by a neck support collar
such that a protruding bag neck
is inset within the recess.

In a particular construction,
a (collapse) fold box carton,
of semi-rigid sheet material,
[configured for a flexible walled inner liner]
has a [location] aperture
to receive a bag liner fill / discharge neck;
and a preformed neck piece,
configured to interfit between carton and bag neck.

Cartons are conveniently corrugated cardboard - for stiffness without undue weight - and faced with a smooth outer layer for printing.

That said, solid board and board with a variety of surface treatment(s) - such as for moisture resistance - may be employed.

The cardboard is desirably moisture resistant to survive a wet fill environment without material degradation.

Liners are thin walled synthetic plastics sheet - single or multiple ply, with edge jointing seams configured to afford a desired filled profile.

In a particular construction, a neck mounting or location aperture may be located in a tuck-in top flap of a folding carton blank.

A preformed insert of semi-rigid synthetic plastics material is configured as a neck collar, or yoke, for installation between carton and liner at juxtaposed liner neck and carton neck aperture regions.

Operationally, carton (pre-)assembly and erection into a 3-D form could be undertaken separately from and preparatory to, bag liner insertion.

In turn, bag liner insertion could be undertaken either before or after contents fill.

In that regard, a consideration is neck piece fitment in relation to closure cap disturbance.

Thus, if neck piece fitment requires closure cap removal, and bag neck pre-insertion through a carton aperture, bag fill post carton insertion is appropriate.

For (hygiene or sterile) sensitive contents, such as foodstuffs or pharmaceuticals, contents seal attends closure cap fitment.

This precludes cap closure removal after bag fill and thus dictates neck piece fitment sequence.

For example, a carton could be part erected from a collapsed flat folded form to an erect upstand with open base flaps and pre-folded top closure flaps.

Top flaps include a tuck-in deck flap, an inboard edge of which is folded into a transverse stiffener ridge.

This ridge upstand bounds a ledge for a discrete preformed stiffener element.

The stiffener is in turn part overlaid upon installation by remaining top lid flaps.

The neck insert could have a peripheral rim upstand, with an edge flange to overlie - or be sandwiched between - in-turned top flaps.

The neck insert - with features of the present invention (ie not merely a retention clip) - may be an interference, slot or snap-action fit upon a liner bag neck.

Embodiments

There now follows a description of some particular embodiments of the invention, by way of example only, with reference to the accompanying diagrammatic and schematic drawings, in which:

Figures 1A and 1B show initial stages of 3-D carton erection from a 2-D carton blank;

More specifically:

Figure 1A shows a 2-D flat sheet carton blank, with a die cut periphery and localised handle apertures;

Figure 1B shows folding of the carton blank of Figure 1A into a tubular 3-D wrap enclosure;

Figures 2A through 2E show progressive stages of box carton assembly from Figures 1A and 1B;

More specifically:

Figure 2A shows, as an initial fold stage, a tubular sleeve carton form, with side walls wrapped around and (re-) united into an enclosure, but opposite end flaps left open;

Figure 2B shows a successive fold stage to Figure 1A, with base flaps closed (leaving aside contents insertion considerations for the present) and initial top flap in fold to create an inset step or ledge with an aperture to receive the neck of a bag liner (not shown);

Figure 2C shows a following stage to Figure 2B, with opposed top flaps now closed;

Figure 2D shows a final carton closure stage to Figure 2C, with top flaps fully closed - and optionally sealing tape across joins;

Figure 2E shows an alternative carton end flap closure arrangement;

Figures 3A through 3C show an insertion sequence for a (generic) inner bag liner, into a part pre-erected outer box carton, of Figures 1A-B and 2A-E;

More specifically:

Figure 3A shows an empty or pre-filled bag liner juxtaposed with an open bottom box carton;

Figure 3B shows fitment of a neck piece insert or surmounting plate, to retain a protruding bag liner neck in a box carton top lid closure flap;

Figure 3C shows closure of box carton bottom flaps to entrap and fully enshroud the bag liner within - apart from the protruding neck;

Figures 4A through 4D show variant detail of a neck piece insert location between box carton outer (lid flap) and inner bag liner;

More specifically :

Figure 4A shows a detail perspective view of a neck piece insert fitted as in Figure 3C;

Figure 4B shows a section along X-X' in Figure 4A, revealing bag liner neck rim, neck piece locator and box carton top flap interfit;

Figure 4C shows a variant neck piece interfit profile to that of Figure 4A;

Figure 4D shows a section along the line Y-Y' in Figure 4C;

Figure 4E shows the variant neck piece of Figure 4C fitted upon an inner bag liner without an outer box carton;

Figures 5A through 5H show variant neck piece or collar insert configurations for fitment between box carton outer and bag liner inner of Figures 1 - 4;

More specifically:

Figure 5A shows a shallow open-sided tray profile, suitable for box carton flat pack stacking - but with an optional depending spill lip and front flange depicted in broken line;

Figure 5B shows an integral pourer funnel;

Figure 5C shows a minimal U-section yoke profile;

Figure 5D shows a more fully developed C-section form with integral pop-up lid flap;

Figure 5E shows a lid with integral pourer or funnel spout;

Figure 5F shows an integrated pop-up / retractable folding handle;

Figure 5G shows a variant of Figure 5D with frangible peripheral tamper evident edge seal - which must be visibly removed or broken for lid opening; and

Figure 5H shows a lockable lid closure flap;

Figures 6A and 6B show alternative box carton outer and attendant erection and bag liner assembly sequences to that of Figures 1 through 3;

More specifically :

Figure 6A shows a part-erected carton with out-turned ledge flat with split or bifurcated arms or limbs to locate a juxtaposed bag liner neck;

Figure 6B shows completion of the bag liner neck insertion of Figure 6A and start of a carton box outer side panel wrap around sequence to create an external envelope, concluded by top and bottom panel in-turn, overlay and tape / glue (adhesive bond) seal;

Figures 7A and 7B show yet another carton box outer and attendant erection and bag liner assembly sequence to that of Figures 6A-B;

More specifically:

Figure 7A shows a carton box outer enclosure with ledge flap deployed to locate a juxtaposed bag liner neck;

Figure 7B shows a successive bag liner neck capture and ledge flap fold insertion step to Figure 7A;

Figures 6A-B and 7A-B depict relative orientations of carton box outer and inner bag liner for co-operative interfit - but the actual orientations of either outer or inner admit of variation.

Thus, say, given a filled bag is more securely kept upright, that is with neck uppermost - as reflected in Figures 6A-B - the variant of Figures 7A-B may be similarly disposed.

Figure 7C shows the final carton closure stage to Figure 7B, with top flaps fully closed - and optionally sealing tape across joins;

Figures 8A through 8D show variant integrations of (extended) neck piece, bag liner and carton;

More specifically:

Figure 8A shows an exploded view of a neck piece extended as a top plate, with underlying bag liner and peripheral carton sleeve;

Figure 8B shows a variant of Figure 8A with integrated top tray with shallow peripheral depending rim and bag liner;

Figure 8C shows a closed container package assembly featuring the top plate of Figure 8A; and

Figure 8D shows a closed container package assembly featuring the top tray of Figure 8B;

Figures 9A through 9D show variant neck plate formats;

More specifically:

Figure 9A shows an extended neck plate configured as an elongate strip, sub-divided by transverse folds - with optional side offshoot panel wings;

Figure 9B shows the neck strip of Figure 9A wrapped around a bag inner element, as an open-sided support collar or shroud ring;

Figure 9C shows a variant of Figures 9A and 9B, with a collar wrapped from below a bag inner and brought together as a handle closure, with an intervening cut-out for the bag neck; and

Figure 9D shows a laid flat 2-D carton blank form of the wrap of Figure 9C, revealing a pre-formed neck recess;

Figures 10A through 10D show overall packaging assembly schemes, with bag liners web-fed to a fill-inflation-separation station for wrap around by progressive fold of a web fed carton blank;

More specifically:

Figure 10A shows a sequence of bag liner web detachment, bag fill and merger with a

collapse-folded, part-assembled, box carton wrap;

Figure 10B shows individual box carton separation from a web or collapse-fold stack;

Figure 10C shows a variant scheme in which a continuous bag liner web is preserved, and successive bags overlaid by respective carton blanks which are then wrapped around and edge sealed;

Figure 10D shows a concertina stack fold of bag liner web segments with flat outer box carton wraps from Figure 10C;

Figures 11A through 11D show a variant box carton construction, in which a neck aperture and recess fold is provided mid-span of a wider lid flap, without lid flap interlock - rather admitting a simple (bonded) mutual overlay.

More specifically:

Figure 11A shows a pre-fabricated 2-D carton blank, with inset bag neck location in-fold panel; it should be noted that for a square box form, end flaps are of even depth;

Figure 11B shows a partially erected 3-D box carton enclosure, with open top lid flaps, ready to receive a bag liner (not shown);

Figure 11C shows closure of top lid flaps and formation of a locally inset ledge or shelf recess at one (longitudinal) top edge;

Figure 11D shows fitment of a pre-formed neck piece, configured as a shallow open-sided tray, upon the shelf recess of Figure 11C;

Figures 12A through 12D show a variant of Figures 11A through 11D, in which the recessed shelf flap is omitted altogether, in favour of a substantial cut-out to receive a pre-formed neck piece, itself providing a shelf recess profile;

Such a cut-out is advantageous either for:

- pre-filled bags, whose closure cap seal cannot be broken for neck piece fitment post box carton insertion; or
- sterile bags which cannot be opened prior to contents fill;

More specifically:

Figure 12A shows a prefabricated 2-D carton blank;

Figure 12B shows partially erected box carton with open top lid flaps, one with localised bag neck cut-out intruding into an adjoining side panel, ready to receive a bag liner (not shown);

Figure 12C shows an assembled box carton, with top lid flaps closed, leaving exposed the localised bag neck cut-out;

Figure 12D shows fitment of a pre-formed neck piece in the bag neck cut-out;

Figures 13A and 13B show a further variant of Figures 11A through 11 D, whereby the neck aperture is provided along the narrow side of a bag in box container;

More specifically:

Figure 13A shows a pre-fabricated 2-D carton blank, with elongated neck aperture top flap and corresponding bottom flap - to provide an off-set flap overlay upon closure;

Figure 13B shows an assembled box carton of Figure 13A, complete with bag, neck piece and closure cap fitment.

Referring to the drawings

A BIB container package assembly 10 comprises an inner bag liner 12 fitted within an outer box carton 11.

Figures 1A through 2E depict a 3-D carton erection sequence from a 2-D flat sheet carton blank 20.

To achieve a rectangular or cuboid 3-D erect form, the 2-D carton blank 20 is subdivided into a series of generally rectangular side panels 18, bounded by respective foldable end flaps 17, 19 forming the erected carton lid or base.

Various cuts, creases and score lines or folds are incorporated to pre-dispose the carton blank 20 into a fold and interlock for erect sequence.

Collapse fold of an erected carton may also be accommodated.

A significant difference over conventional cartons is a waisted neck flap 16 with aperture 24 for a bag liner neck 13.

This neck flap 16 folds to an inset ledge or recessed platform for a bag liner neck 13 - and is in turn supplemented by a neck piece 14.

The neck piece 14 may be:

- a discrete element - as shown in Figure 3B;
- wholly or partially integrated (or connected) with the bag liner - as shown in Figure 4E; or
- wholly or partially integrated (or connected) with the box carton - as shown in

Figure 9A.

Variant neck piece 14 forms and features are depicted in Figures 5A through 5H.

In the assembly 10, a bag contents (fill and discharge) access neck 13 protrudes from an (upper) end flap 16 of the box carton 11 through an aperture 24.

The bag neck 13 is located by a neck piece insert or location and restraint collar 14, which engages a location rim 15 at the neck base and overlies a box carton top closure or lid flap 16.

The bag neck 13 is thus restrained from retreating into the box carton 11.

Bag neck 13 may incorporate screw thread grooves 28 for complementary interfit with a screw threaded closure cap 26.

The neck piece 14 is an open-sided shallow tray, with a 'C' - shape rim upstand and peripheral flange 25, marginally overlying a box carton upper lid flap 17.

Figures 4A and 4B depict a discrete neck piece 14.

Figures 4C through 4E depict an integrated neck piece 14 and bag liner 12.

This allows BIB use at a contents fill station for conventional jerrycans - at which neck loads are applied to trigger discharge valve operation.

Side wall and end panel handle grip apertures 21 are provided for handling upon box carton 11 assembly.

These handle apertures may feature a hinged closure flap, readily contrived cutting only part of the aperture boundary profile, and creasing a residual jointing or entrainment edge.

As is evident from Figure 2B, one upper carton lid flap features transverse creases or folds to allow adoption of a stepped profile or ledge.

Figure 3A shows insertion of a generic bag 12, with a top edge closure seam 30, into the open bottom end of an otherwise part pre-assembled box carton 11.

The box carton 11 has closed top flaps 17 and pre-folded inset or recessed ledge 16, ready to receive a discrete neck piece 14, as shown in Figure 3B.

Neck 14 piece fitment, such as shown in Figures 4A and 4B, effectively retains the bag liner 12 within the box carton 11, while bottom flaps 19 are folded closed, overlaid by tape 27 and/or adhesive bonded.

Figures 7A through 7C show an alternative top end box carton loading sequence to the bottom end loading of Figures 3A through 3C.

Again, the box carton 11 is part pre-assembled into a wrap, but with closed bottom end flaps 19 and open top flaps 17, 41 for access.

As the bag liner 12 remains accessible throughout box carton insertion, such top-loading might be adopted for either an empty or filled bag liner 12.

An extended top flap 41, with split or bifurcated limbs 42 about neck location aperture 43, guide bag neck access, and folds down, bringing the bag along with it, culminating in closure and formation of a recess for the otherwise protruding bag neck 13, as depicted in Figure 7C.

Figures 6A and 6B show bag liner 12 and box carton 11 assembly with the carton reverse folded preparatory to formation of a wrap enclosure.

A top lid flap 41, with bifurcated opposed guidance limbs 42 to a neck location 43, is turned back to facilitate juxtaposition with a (filled) bag liner 12, as depicted in Figure 6A, preparatory to wrap around fold of carton side walls 18, as depicted in Figure 6B.

Figures 8A through 8D show 'drop-in' top-loading for a bag liner insert in an open-top pre-assembled box carton 'bucket' 50.

A top plate or tray 51, with integral step ledge or recess 52 around a neck location aperture 53, substitutes for carton top lid flaps 16, 17.

Such a tray is either:

- a discrete element 51 - as reflected in Figures 8A and 8C; or
- integrated, through a peripheral depending flange or rim 54, with a bag liner 12 - as reflected in Figure 8B and 8D.

Carton and neck piece integration is implemented in another way in Figures 9A-D, by a contiguous top plate or strip 60, with local recessed neck aperture 61, side walls 62 and end closure flaps 63.

The strip is brought over a filled bag liner 12, as depicted in Figure 9A and wrapped around as a ring, loop or band, as depicted in Figure 9B.

Figures 9C and 9D show a wrap executed from below a filled bag liner 12, with optional cruciform carton blank contour, as depicted in Figure 9D, to provide side walls 62 for a complete enclosure brought together with top handle elements 64, as depicted in Figure 9C.

Carton lift by such handles 64 thus helps secure the wrap around the liner and vulnerable bottom flap joins are avoided in favour of a continuous panel (loop or ring) sequence.

The choice of individual and co-operative box carton 11 and bag liner 12 configurations reflects the intended assembly and fill sequence.

Figures 10A and 10B reflect an abstraction of automated assembly from respective web fed collapsed bag liner 12 and box carton 11 stacked flat pack lines.

Figures 10C and 10D reflect a variant automated assembly preserving a continuous bag liner web, with individual bags wrapped in respective flat box carton wraps.

The bag liners and/or box cartons can feature neck piece fitment, connection or integration - preparatory to uniting of bag liner and respective box carton wrap while still entrained in a continuous web.

In a concertina fold stack of Figure 10D necks and neckpieces alternate for compactness.

Box carton 11 flat pack facility is contingent to some extent upon recessed neck piece 14 profile - hence the advantage of the shallow tray 31 forms of Figures 5A through 5H.

In that regard, introducing a drip guard or splash back extension 35, as indicated in broken line in Figure 5A, may still be accommodated, by allowing a crease or fold and a corner edge junction.

Again, bag liner 12 pre-fill or post-fill can be accommodated.

Alternative neck piece configurations may include an integral funnel 38, a flip-top lid 32, a pourer or spout 33, a pop-out handle 34, a frangible tear strip 36, or a lock 37.

Compact transport and storage can be preserved for either bag liner 12 or box carton 11 elements, individually or together, until pre-erection of a hollow shell format preparatory to contents fill.

Conceivably, contents fill itself could be used to promote such pre-erection of interfitted bag liner 12 and collapse folded box carton 11 - albeit not shown.

Figures 11A through 11D reflect a refinement of the box carton 11 format of Figures 1A through 2E.

That said, corresponding bag liner 12 insertion and neckpiece 14 fitment considerations, such as of Figures 3A through 5H generally apply.

Similarly, with the minimal neck cut-out box carton variant 80 of Figures 12A through 12D.

Neck location lid (end) flap or panel 16 of Figure 1A occupies the full panel width and, upon in-fold and carton erection, interlocks with juxtaposed side lid flaps or panels 17 through slots 29.

In an alternative format, a bag neck location panel 76 occupies only a localised (mid-) portion of a carton lid flap or panel 73, as depicted in Figure 11B.

Moreover, lid panel 73 interlock can be substituted by simple lid panel 73 mutual overlay and adhesive bonding and/or supplementary edge joint taping 27.

Thus, an inset (bag neck location) panel 76 has an aperture 71 to receive a bag neck 13 (not shown).

Neck panel 76 spans between a base edge fold 77, marginally inset from the top edge of a side panel 78 and a step fold panel 72 intruding into lid panel 73.

A corner cut-out profile 74 of adjacent lid panels 79 accommodates the neck panel 76 when the lids are folded over to close the carton top, as depicted in Figure 11C.

Rounded corners may be adopted to relieve stress and complement a corresponding neck piece profile, or a rectangular corner may be overlaid by a rounded neck piece corner profile.

In that carton closed condition, the neck panel 76 is inset as a recessed ledge 81.

A discrete pre-profiled neck piece insert 75, configured as a shallow open-sided tray, is sited upon ledge 81, as shown in Figure 11D, and retains a protruding bag liner neck 13 with closure cap 82.

The carton variant of Figures 12A through 12D further refines the proposition, with a complete neck cut-out 83, of corresponding outline to but substituting for, neck panel 76 of Figure 11A.

Upon carton closure, as depicted in Figure 12C - again with a bag liner 12 insert omitted for clarity of illustration, a neck aperture 83 is created generally mid-span along one top corner edge of the carton.

Into this neck aperture 83 is fitted a pre-formed neck piece 75, for bag liner 12 insert retention at a protruding bag neck 13, as depicted in Figure 12D.

A further carton variant is shown in Figures 13A-B, whereby a similar neck aperture 94 to that depicted in Figure 11A is adopted, however, this time it is provided along the narrow side 93 of a cuboid container.

Alternatively, neck aperture 94 could be provided on along the wider carton side 95.

The carton blank 90 in Figure 13A is provided with an elongated neck aperture top flap 91 and corresponding bottom flap 92 - thus affording greater space for neck collar fitment and contents access.

Consequently, an off-set flap overlay results upon carton closure.

Figure 13B shows an assembled box carton 96 constructed from the carton blank 90 of Figure 13A.

This is complete with internal bag, neck piece and closure cap fitment.

In Figures 11A-D, 12A-D and 13A-B variants a recessed neck and attendant closure are contrived - preserving a uniform, in this case rectangular, outer container profile or contour.

Generally, for simplicity of fabrication, rectangular carton forms are convenient, in principle other, say curvilinear forms could be contrived with appropriate delineation of cuts, creases or folds in a 2-D carton blank.

Either single or multiple, co-operatively interacting carton blank forms may be employed - say for increased overall sizing, beyond individual carton sheet supply constraints and/or more complex forms.

Inter-nesting carton and/or bag forms may be employed for greater robustness and security.

Thus, say, a multiple-walled structure would afford redundancy against impact or penetration - useful in spillage containment for hazardous contents.

Mix'n Match Features

The various embodiment features may be 'mixed and matched' selectively – albeit it is not feasible to show every possible feature permutation or combination.

JERRIBOX™ vs Jerrycan

The following outline is presented by way of supplementary perspective upon the particular embodiments described separately, in relation to traditional jerrycans :

Overall Objective

A so-called JERRIBOX™ {which term is used for convenience herein} according to the present invention is a bag-in-box container package emulating certain traditional plastic [jerrycan] container characteristics, whilst delivering significant supply chain benefits.

It represents an integrated packaging approach to containerisation.

Positive jerrycan characteristics summarise as:

- User familiarity;
- Ease of use;

- Accessible cap / pouring;
- Ease of filling;
- Outdoor or damp atmosphere compatibility;
- Robustness;
- Option of attaining so-called 'UN' certification for hazardous goods;
- Product size range;
- Availability and price.

A JERRIBOX™ provides these characteristics, but in a BIB package - with a pack look of a jerrycan container and equivalent functionality.

Thus, for example, the cap is exposed and the pouring handle is behind the cap.

Moreover, in terms of competitive containers, smaller sized jerrycans are commonly assembled into a combination pack within an outer box - to facilitate palletisation and allow surface graphics.

The JERRIBOX™ obviates the need for outer carton wraps and allows shrink-wrapping of stacked units.

JERRIBOX™ Features

Moreover, the JERRIBOX™ provides major benefits compared with a conventional jerrycan container:

1. In-bound Material Logistics

JERRIBOX™ can be supplied flat-packed, in pallets or containers.

Jerrycans are supplied as complete bottles and inevitably involve shipping fresh air.

This means frequent packaging replenishment delivery and unproductive use of valuable packaging storage space.

A recent customer study showed a former need for 250 pallets a week of jerrycans reduced to 25 pallets a month of flat-pack BIB material.

2. Individual Usage

The flat pack facility of JERRIBOX™ is also beneficial beyond business-to-business applications.

Thus, camping caravanning and other outdoor pursuits can gain from travelling space usually occupied by large, fixed-form, water carriers.

Water carriers supplied flat-packed could also be of major advantage in disaster relief.

Flat-pack fuel containers are also feasible, with appropriate materials.

Containers could feature integrated ground wheels or skids and bespoke trolley carriages contrived.

3. Out-bound Logistics

JERRIBOX™ containers filled with product are more efficiently packed, stacked, palletised and containerised than jerrycans.

The latter are usually packed overlapping the pallet (periphery) to help achieve a more stable load.

Jerrycans also lose capacity to handles and radiused surfaces.

A JERRIBOX™ could be sized to fit standard pallets precisely, for an intrinsically stable load.

That is close mutual juxtaposition and abutment of load elements inhibits their relative movement.

A JERRIBOX™ pack is lighter than an equivalent size jerrycan - contributing to pack load efficiency.

4. Waste Disposal

At the far end of the supply chain many jerrycan products are difficult to dispose of into the waste stream.

This can result in elaborate and costly 'reverse logistics'.

JERRIBOX™ again takes advantage of flat-pack benefits as the plastic and paper elements divide easily into respective waste streams.

The lower packaging weight gives cost advantages in packaging waste obligations.

5. Product Presentation

A JERRIBOX™ container outer surface can display product branding, promotion and information - in simple formats through to multi colour high quality laminated finishes.

In contrast, Jerrycans are usually limited to labelling or sleeves - with limited decorative surface.

JERRIBOX™ Design

To ensure that JERRIBOX™ competes effectively with the jerrycan at the most

important point . . . in the hands of the end user . . . several design elements have been created.

1.

Bags used in the JERRIBOX™ range may be generic free-form pillow bags or of complementary rectangular format, such as from the proprietary QUAD range, manufactured by C-PAC International.

They have two features complementary to the JERRIBOX™ and significant to achieving jerrycan container feature emulation, vis:

- bags are top-filling and dispensing; and
- adopt a space efficient ['cuboid'] filled shape.

Such bags are available in a wide range of sizes and materials, and in single or double layer formats.

Liquids from most industries can be accommodated.

2.

JERRIBOX™ features an integral recessed or inset supporting 'shelf', or bracing ledge, for a container neck and cap.

The recess allows inset of an otherwise protruding neck and closure cap within a rectangular outer box carton profile - allowing space-efficient compact stacking and packing, such as upon palletisation.

The shelf profile interlocks with other carton (top) flaps, for maximum strength.

This shelf uses minimum material and is within an otherwise conventional '0201' box configuration.

An exposed accessible cap and filler is an important functional link with a jerrycan and allows former users of jerrycans to fill with existing equipment.

Over a JERRIBOX™ range, box sizes have been optimised for palletisation on regular and eur-pallets.

3.

This supporting shelf - and its function of holding a liquid (bag) container neck of - is enhanced by a pre-formed plastics collar insert, or neck piece, configured to:

- snap fit around a bag liner neck flange;
- assist bag support; and
- supplement carton wall (board )stiffness, upon liquid damage.

The collar is shaped to:

- close off an otherwise open area of the box carton around the neck; and
- protect exposed edges of box material, again from dampness.

The collar also locally reinforces the box, while partially surrounding and protecting the cap.

Pack integrity is maintained in pallet stacking, or if the pack is dropped onto its top face.

Collar profile may be minimised - for consistency with carton flat-pack, or optionally extended - as a splash guard to prevent local carton soaking at the neck.

Collar design also enhances JERRIBOX™ identity and appearance - making it immediately identifiable as a jerrycan competitor or substitute.

4.
The collar provides a basis for optional features, vis:

- configuration to a minimal sized, simpler format yoke - to save cost, particularly on smaller size packs; board protection and support would be preserved, albeit without necessarily an appearance benefit.
- (flip-top) lid, to protect an exposed cap;
- integrated lid pourer or spout; and
- handle folding into collar recess.

Tamper evident seals and even cap locks are feasible.

Collar and attachment sizing allows adaptation for different sized necks.

5.
The box carton admits die-cut flat material.

Overall, JERRIBOX™ equals or betters entrenched plastic jerrycan functionality.

Environmental water, damp or splash proofing can be accommodated.

Filling and dispensing can also create dampness - although the collar protects the carton from spillage.

Occasional leakage can be contained by proofed carton board.

This avoids individual wetted box collapse and entire pallet spoilage risks.

Carton board options embrace:

- fully waterproofed solid;
- one-side protected solid;
- coated corrugated;
- regular non-water-protected corrugated;
- plastics corrugated;
- solid or laminated (plastics) sheet (to allow profile pre-form);

Most such boards are available in a wide range of printed formats.

It is anticipated that fully waterproofed solid board will be a lead constituent.

6.
A size range can imitate / emulate the jerrycan, vis:

- 3 litre
- 5 litre
- 10 litre
- 15 litre
- 20 litre
- 25 litre
- 4x 3 litre
- 3x 5 litre multi-pack
- 2x 10 litre multi-pack

Unlike prohibitive mould tooling costs for jerrycans, it would feasible, at relatively modest cost, to contrive bespoke JERRIBOX™ sizes and configurations for particular customer and market needs - such as imperial, metric or US volumetric measures.

7.
Package assembly is an important consideration, given that existing industrial jerrycan users do not need to assemble the pack - although labelling is an extra activity.

The drawings variously depict assembly and tape or glue closure, undertaken by mixed manual and mechanised operations, together with automated pre-assembly of bag liner and box carton.

8.
For some important market sectors, the JERRIBOX™ will need to pass UN certification testing - although there is a large market where this is not essential.

Certification will likely be with fully water-proofed solid board cartoning.

+++

Component List

10 package
11 carton box outer
12 bag liner
13 bag neck / spout
14 neck collar
15 neck rim
16 ledge flap
17 top flap
18 side wall panel
19 bottom flap

20 carton blank
21 handle aperture
24 neck location aperture
25 rim flange
26 closure cap
27 bonding tape overlay
28 screw groove
29 slot

30 top edge closure seam
31 yoke
32 flip-top lid
33 pourer
34 pop-out handle
35 splash back extension
36 frangible tear strip
37 lock
38 integral funnel

41 bifurcated ledge flap
42 limb
43 access (entry) slot

50 box carton 'bucket'
51 top plate
52 step ledge
53 neck location aperture
54 top plate rim

60 contiguous carton strip
61 recessed neck aperture
62 side walls
63 end flaps
64 top handles

71 neck aperture
72 recess fold
73 wide lid flap
74 cut-out profile
75 pre-formed neck piece
76 neck location panel
77 base edge fold
78 side panel
79 lid panel

80 minimal neck cut-out box carton
81 recessed ledge
82 closure cap
83 neck cut-out

90 carton blank
91 top flap
92 bottom flap
93 narrow side
94 neck aperture
95 wide side
96 carton